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ENHANCEMENT OF THE CONTRIBUTION OF INDUSTRIAL MINERALS TO THE ECONOMIC PROGRESS OF AFRICA

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I. INDUSTRIAL MINERALS

Introduction

1. Industrial minerals comprise all rocks or minerals, except metallic and energy substances as well as gems, of economic importance. In the present study, it will not be possible to consider all the extremely vast types of minerals and their very varied and numerous uses. Only phosphates, potash, limestone and dolomite - which are construction raw materials - are discussed. These substances experienced a period of difficulty from 1981 to 1988. With the use of fertilizer reaching its ceiling in industrialized countries, consumption of phosphates and potash has seriously declined. For African phosphate-exporting countries, the appearance on the scene of such new producers as Jordan and Israel has further disturbed the world market. Prospects for predominantly export-oriented production is gloomy, even though there has been an increase in the prices of phosphates and potash since 1988, and efforts were made by African producers to find new markets between 1981 and 1988. Hence, local consumption has assumed an important role, as an increased production meant for local industries has contributed to the development of the mining sector, which is very sensitive to world market fluctuations.

At the world level, the construction material industry has suffered from an overproduction capacity in relation to demand during the period covered by the study. Faced with this situation, producers have devised various strategies aimed at conserving or penetrating markets. In Africa certain countries have conducted research to enable them to formulate policies limiting the importation of construction materials. These efforts, although insufficient, are still maintained. The substitution of imports with local products should encourage the development of local construction raw materials whose demand is bound to increase, considering the current low level of construction and the rapid rate of population growth.

This study will consider the situation of African industries during the period 1981-1988 and their prospects for the 1990s, with regard to:

(i) phosphates and potash; and

(ii) lime, burnt dolomite and cement.

II. PHOSPHATES AND POTASH

2. Phosphates and potash, fertilizer raw materials, are meant for agriculture which is Africa's prime concern. The role of fertilizers in the modernization of this economic sector and the capacity of certain African countries having the resources for their manufacture, to produce them locally, thus minimizing, indeed eliminating, their dependence on the importation of these substances and thereby reducing the financial constraints caused by the lack of foreign exchange, explains the choice of these two substances. However, the consumption of crude phosphates and potash justifies the contribution of local consumption of mining resources and products to the strengthening of the mining sector in Africa.

3. Emphasis should be placed on mineral deposits which may be exploited on a small-or medium-scale basis. However, since current mining in the continent

is large-scale, it is discussed in the light of the study on the situation of the phosphates industry in Africa between 1980 and 1988 and its prospects for the 1990s. An increase has been recorded in phosphate mining production for local consumption owing to an increase in domestic demand. This situation, if maintained, may encourage countries that have currently suspended production as a result of the world market conditions, to embark upon small-scale mining (even if it means increasing it later) for productions meant for local industries and markets.

III. PHOSPHATES

A. SITUATION OF THE PHOSPHATE INDUSTRY IN AFRICA DURING THE PERIOD 1981-1988

Availability of resources

4. There are abundant phosphate reserves in Africa, although unevenly distributed. Morocco and Western Sahara alone have more than one half (55.64 per cent) of world reserves, the United States which comes second has only 20 per cent, USSR 7 per cent and the Republic of South Africa 6 per cent. The remaining resources are scattered between other producers, among which are still African countries, such as Egypt, Senegal, Togo and Tunisia.

Market

5. Between 1981 and 1987, the world phosphate market was saturated, with the result that African producers had great difficulty in marketing their productions owing to low price, poor demand and competition mainly from such new producers as Jordan and Israel. This situation led certain African countries to increase the amount of phosphates meant for local consumption, especially for the production of phosphoric acid and auxiliary fertilizers. In 1988, the situation improved slightly for African producers, following improvement in prices, access to new markets such as Australia for Togo, and increase in quantities to be purchased under former agreements, as in the case of Tunisia.

Production

6. In 1988, world production of phosphates increased by 5.31 per cent, as compared to the preceding year, thus putting an end to a period of depression, mainly between 1985 and 1987. That year, world production rose to 155,379 million tons of crude phosphates, as against 147,113 millions in 1987. Africa's contribution was 39,243 million tons or about 25 per cent of world production.

Morocco, Africa's largest producer, produced 24,783 million tons or 15 per cent of world total ranking fourth after the United States, USSR and China. It accounted for 63 per cent of Africa's production, followed by Tunisia with 5,103 million tons or 15 per cent of the continent's production, Togo with 3,364 million or 6 per cent, Algeria and Egypt with 1,332 and 1,146 million tons or 3.4 and 2.9 per cent, respectively.

At the level of each country the production situation is as follows:

Morocco

7. Affected by world production, Morocco experienced a depression in its production between 1981 and 1987 only to recover from 1988, thus increasing its production from 20,954 million tons in 1987 to 24,783 million in 1988 - an increase of 18 per cent. This was due to the high sales to foreign countries, with an increase of 9 per cent in its export and of 31 per cent in its local consumption. Large-scale phosphate extraction is controlled by the Office chesifien des phosphates (OCP), a State conglomerate whose subsidiaries are very active in such various aspects as development and utilization of phosphates. This conglomerate mines the Gaoulore deposits (in Youssoufia and Ben Guérir), the Khouribga deposits which is the largest area under exploitation, and the Bu Craa deposit in Western Sahara.

In recent years, "black phosphates" have constituted one of the areas of concern of the OCP. Located to the south of Youssoufia, below the ground water, these phosphates are found in their crude (non-oxidized) state. Their blackness is due to the coal impurities they contain. Black phosphates first need to undergo heat treatment before being used in fertilizer manufacture. The high carbon content facilitates the calcination process which thus requires the use of less fuel. In spite of difficulties in placing this type of phosphate on the world market, Morocco has continued its production - even stretching to 130 per cent the capacity of its former calcination unit and establishing three new ones in order to meet local needs.

Tunisia

8. Tunisia's production in 1988 was 6,103 million tons, as against 6,390 million in 1987, 5,951 million in 1986 and 4,530 million in 1985. The State Phosphates Company at Gafsa, which operates eight mines, seven of which are concentrated in the Gafsa/Sehib area, had great difficulty in placing its production on the world market, particularly during the depression period, 1985-1987. It, therefore, made efforts to manufacture phosphoric acid and set up a fertilizer industry. With this, it has continued to produce phosphates at full capacity for stockpile. However, its production policies, mainly the expansion of the Gafsa mines, are highly dependent on the expansion of the local fertilizer industry.

Togo

9. The phosphate industry in Togo is based on the mining activities of the State-owned Office Togolais des phosphates and on the phosphate reserves originally estimated at 81 million tons and concentrated at Akoumapame and Hahotoe, about 30 km from the processing factory and the Kpeme exporting port.

Togo produced 3,464 million tons in 1988, as against 2,644 and 2,300 million in 1987 and 1986, respectively.

Senegal

10. Phosphate production in Senegal is carried out by two companies the larger of which is the Compagnie Sénégalaise des phosphates de Taiba (SPT), a company jointly owned by the Senegalese Government (50 per cent shareholding); CONFRAMINES (15.6 per cent); IMC (11.1) per cent); COFIMAR (7.8 per cent); OMNIUM which produces chemicals for agricultural industries (4.7 per cent); the Caisse de Depot et de Consignations, (4.5 per cent); and Compagnie

Industrielle Minière, a subsidiary company of Rhone Poulenc (2.95 per cent). The SPT started production (82 per cent of tricalcic) in 1960 at the Ndomour Diop mine in the region of Tivouane and currently mines the Keur Mor Fall deposits whose reserves are estimated at 30 million tons. The production capacity of this mine is 2.2 million tons per annum, but its annual production is only 1.75 million, 500,000 of which goes to the local market.

The second company is the Societé Senegalaise de Phosphates de Thiès, a corporation jointly owned by the Senegalese Government and Pechiney. It mines the Pallo deposit which has been in production since 1957 and which produces natural aluminum phosphates, calcic and aluminum phosphates and tricalcic phosphates. Up to recently, estimates had put production of aluminium phosphates at 300,000 tons per annum, whereas it was only 131,000 tons in 1986 and 191,000 in 1987 owing to unfavourable world market conditions at the time. The production of calcic phosphates which was 75,400 tons in 1986 fell to 36,700 tons in 1987 due to price decline.

Algeria

11. Production of phosphates increased by 24 per cent in 1988, in Algeria, moving up from 1,332,000,000 tons in 1987 to 1,973,000,000 tons in 1988. It is carried out by the national metal and phosphates enterprise (FERPHOS) through open-cast mining at Djebel Onk, located at 20 km from the border with Tunisia.

Egypt

12. Egypt's production of crude phosphate (at 25 per cent P205) increased by 4 per cent in 1988, rising from 1,103,000,000 tons in 1987 to 1,146,000,000 tons in 1988. The mining sites are located at Sebaiya on the Nile, South of Luxor and close to Safaya and Quseir (ports on the Red Sea). Most of the production is consumed locally for fertilizer production.

Zimbabwe

13. Here, production which is about a million tons fell in 1988 following an explosion during the launching of a new sulphuric acid factory for the Zimphos fertilizer manufacturing company, located at Msasa, which, produces superphosphates. The mineral used is apatite mined at the Dorowa deposits located at 150 kilometers south of Harare, with reserves estimated at 75 million tons and phosphates assayed at 6.6 per cent of P205.

The United Republic of Tanzania

14. In the United Republic of Tanzania, production commenced in 1983, but only 20 per cent of the mine's capacity estimated at 100,000 tons, are used because of transport difficulties and the fertilizer factory's problems.

Mali

15. The phosphate deposits at Tilemsi, 150 kilometers north of Gao in Mali are currently being mined. The extracted rock is crushed at a factory in Bourém which has been in operation since 1981. Production is planned to reach 240,000 tons per annum, but the expansion programme is bound to be affected by the problems of transport and access to the local markets.

B. PROSPECTS FOR THE PHOSPHATE EXTRACTING INDUSTRY IN AFRICA DURING THE 1990s

16. Such prospects are examined in the light of the following factors:

(i) Projects for the expansion of phosphate production units, the development of deposits and use of the minerals;

(ii) Factors affecting the execution of these projects.

The expansion project

Morocco

17. The Chenouane deposits in the Khouribga region in Morocco was the object of a mining campaign in 1989 aimed at developing a master plan for phosphate extraction. The Chenouane production will eventually reach 12 million tons per annum.

However, in 1988, studies and actions were carried out aimed at establishing a new solid fertilizer production unit at Jorf Lasfar. This unit will also produce Di Ammonium Phosphate (DAP), one of the most marketed in the world in terms of volume. The introduction of DAP as one of the products manufactured at Jorf Lasfar would allow for the continuous expansion of phosphate production. Hence, the Office cherifien des phosphates has already planned to increase six-fold the size of the Jorf Lasfar fertilizer production complex, which is already one of the largest fertilizer complexes in the world.

Tunisia

18. The expansion programme, already under way in the Gafsa mining area in Tunisia, is being continued as a function of the needs of the local fertilizer industry, the expansion of which will lead to the opening of two new open-cast mines in the 1990s, at Jellabia and Sehib/Sud (capacity unspecified).

The new projects

Morocco

19. A feasibility study has already been carried out on the Meskalas deposits with the assistance of Soviets. The reserves have been marked out, but no extraction programme has yet been established, perhaps owing to geological problems and low prices of phosphates. Nevertheless, large-scale extraction may soon commence near Odessa, where a crude phosphate reception terminal with a capacity of 3.2 million tons has already been constructed, and in 1989, the Soviet Union had promised to import during that year 800,000 tons of crude phosphates from Meskalas.

Tunisia

20. In this country, a huge phosphate development project was postponed till the 1990s. A study is already at an advanced stage on this huge project planned for Sra Ouertane linked to and to be executed together with a chemical complex at the same place.

Togo

21. Togo has a project for the establishment of a phosphoric acid production unit, still awaiting funding, which may be under a joint-venture. The execution of this project may lead to the development of a new mine to exploit the Daghati reserves.

Senegal

22. The Tobene deposits whose total reserves are estimated at 50 million tons would enable the Senegalese phosphate mining company (SSPT) to continue its mining operations, even after the Keur Mor Fall reserves will have been exhausted. It will be financed by SSPT itself. If the execution of this project, which has been adversely affected by unfavourable world market conditions and their impact on the company's earnings, is truly carried out, it will enable SSPT to increase its capacity for producing natural aluminum phosphates, from the current 300,000 tons to 650,000 tons per annum and tricalcic phosphates to 100,000 tons per annum.

Another project for development is the Semme deposit, located close to Matam in the North of the country. This deposit has already been studied by SOCOMINE, a subsidiary of BRGM, which established that it contained 40 million tons of calcic phosphates which may be exploited at a rate of 1.5 million tons per annum. The total cost of the project, including cost of infrastructure, would be about $US 110 million. The initial plan was for large-scale extraction, while subsequent studies suggested small-scale exploitation for local consumption.

Egypt

23. The old phosphate mining project at Tartu, to the north-west of El Kharga in Egypt, is still to be executed. A marketable product assayed at 28 per cent of P205 may be extracted initially at a rate of 2 million tons per annum and later increased to 3.5 million tons. The mining operations may commence at the beginning of the 1990s.

24. Elsewhere in the non-producer countries the following deposits may be cited:

Burkina Faso

Here, there are three deposits at Arly, Kodjari and Aloub-Djomana located at the South-east province of Tapoa (Diapaga), towards the border with the Niger and Benin. These are rocky calcic phosphates with a mineral content graded at 29 per cent of P205. The Aloub-Djomana reserves are estimated at between 50 and 100 million tons while that of Arly contains only 5 million tons. The Kodjari crude phosphate deposit, proved to be by far the largest of the three, with reserves of 63 million tons has been the object of a pilot project under which 5,635 tons were produced between 1978 and 1985. The mobile crushing, screening and grinding unit with a capacity of 2.5 tons per hour has been financed by GTZ, a bilateral aid agency of the Federal Republic of Germany. These phosphates have also been tested for direct application in various agronomical centres in the country and found to increase performance of such products as rice and millet by 30 and 60 per cent, respectively - a fairly encouraging result. Currently, its production is by artisanal exploitation and a project known as project phosphate de Burkina has been set

up to promote the development of phosphate deposits to be used in local agriculture. In this regard, studies are currently being conducted on the sulphurated deposits at Parkoa planned to be mined for producing sulphuric acid. Burkina Faso plans to produce the NPK type of fertilizer.

The Niger

26. In the Niger, geological and evaluation activities have been carried out on the Tahoua and Tapoa deposits. Tahoua has unpublished huge reserves while the proved reserves at Tapoa are 170 million tons, assayed at 27 per cent of P205. The Tahoua deposits was mined up to 1988 when exploitation was suspended, while the results of studies conducted by IFDC on the Tapoa deposits indicated that there are favourable prospects for direct use of crude phosphates produced there.

Factors influencing the execution of the expansion programmes and other projects

The market situation in the 1990s

27. As mentioned earlier in the study, the bulk of world crude phosphate production (80 per cent) is used for fertilizer manufacture. Several factors affect the demand for phosphates namely: climatic variations such as drought; the economic situation of countries, for instance, in the 1980s the Brazilian fertilizer market was affected by that country's external debt; the situation of agriculture, hence in Western Europe, the major market for African phosphates and derivatives, this situation is marked by a decline in the use of fertilizers mainly phosphates, and a growth in population.

The West European market is currently saturated, and there is a steady decline in the use of fertilizers in various countries. An improvement in external marketing of African phosphates and derivatives in 1988 came following the exhaustion of the Christmas Island phosphate reserves in Australia, leading to access to that market by Togolese phosphates because of their quality, and also due to the increase in quantities purchased under former agreements. There will be no a priori significant change in the supply of Western Europe with African phosphates and their derivatives in the 1990s.

In Africa itself, the local market should play a greater role in the 1990s, particularly with population growth and the great need to modernize agriculture. This implies an increased use of fertilizer, especially phosphates and phosphoric acid. Statistics on the use of fertilizer in sub-Saharan Africa during the period 1970-1987 shows an annual growth rate of 6 per cent, whereas production increased only a little. Between 1985 and 1986, the gap between fertilizer consumption and production in the continent was 1,014,000 tons, whereas between 1965 and 1970 it was only 130,000 tons. This difference is bound to increase in the 1990s, unless decisions aimed at promoting an increased fertilizer output to meet local needs are taken and implemented.

In short, there is a potential considerable phosphate-based fertilizer market in Africa. It is true that the market is very small at national levels, but the emergence of subregional and regional markets may resolve this problem.

Market capture policies

28. Generally, the phosphates industry in Africa, except in Togo, is very integrated, starting from the extraction of crude phosphates up to the often-well-developed chemical production stage. This development is in response to changes in the world market situation and has recently led to the inclusion among products derived from phosphates such fertilizers as DAP (Morocco). Formerly (1985), the sale to the USSR of solid fertilizers such as Triple Super Phosphate (TSP) and the increase in exports of Mono Ammonium Phosphate (MAP) to Western Europe enabled Morocco to compensate for the losses incurred in its sale of crude phosphate to Western Europe (21 per cent loss) or to Asia (29 per cent loss).

Financing the expansion programmes and projects for the development of the deposits

29. The expansion programmes are financed by the extracting organisations themselves which, in most cases, are also producers of phosphoric acid and fertilizers. This financing is made possible by the surplus earned from the sale of their products and the loans obtained from international financial institutions, guaranteed by such surplus; yet their income is uncertain as it is dependent on the narrow and precarious market (international or local). For example, the low world demand and prices of crude phosphate between 1981 and 1987, caused by serious competition from such new and small producers as Jordan and Israel coupled with the drought which hit the country, placed Morocco in a very difficult situation in 1983. Hence, it accumulated so much external debt service arrears that it could not obtain the necessary loans to carry out its phosphate mining projects and phosphoric acid and fertilizer manufacture. As for projects for the development of new deposits, attempts to obtain local financing and/or investment were frustrated owing to the meager financial resources of the countries which have no choice but to stake on external resources, which are not forthcoming due to the debt problems of African countries.

Considerations with regard to environmental problems

30. The manufacture and increase in the production of phosphoric acid (H_2PO_4) in such African countries as Morocco are influenced by certain environmental considerations in Europe. In fact, owing to the enormous pollution produced by the manufacture of sulphuric acid which is required for breaking down crude phosphates in the process of H_2PO_4 manufacture, European countries impose draconian conditions resulting in excessively high production costs. The non-imposition, so far, of such conditions in Africa facilitates the development of these industries in the continent.

However, African phosphate-producing countries, in their efforts to integrate relevant industries, should be cautious about the dark side of the picture which involves (a) the risk of water and air pollution by products such as NPK; (b) the rejection by certain European countries of their products for reasons of standards; and (c) the loss in foreign exchange from the importation of sulphur necessary for these industries.

In this regard, it is good to note that countries such as Zimbabwe are currently conducting research on direct application of crude phosphates.

II.2 POTASH

31. The term potash is used to describe a group of potassic salts which include potassium chlorides (90 per cent) containing 60 to 62 per cent of K20, potassium sulphates (4 per cent) containing 50 to 53 per cent of K20 and mixed salts whose K20 content ranges from 10 to 50 per cent and which is of special importance. In fact, these products contain magnesium which plays an important role in soil fertilization. This explains why potash is often used for fertilizing farmlands (over 90 per cent of this product is used for this purpose) either alone or together with one or several of such other fertilizers as nitrogen and phosphate to form compound or complex fertilizers (binary or compound mixtures).

A. Situation of the potash industry in Africa during the period 1981-1988.

32. The largest deposits of potash in Africa are in the Congo and Ethiopia.

33. The Congo has vast potash resources, mainly carnallite, found in form of beines near Bolle. The reserves are about 300 billion tons, equivalent to 5 billion tons of K20. The more limited sylvinite resources were mined between 1969 and 1977. The mine was closed because of flooding.

34. In Ethiopia, potash is found in the Denkel depression in the Tigray Province. The sylvinite reserves are estimated at 166 million tons, 66 million of which has been confirmed. There are also substantial carnallite resources which are not mined currently. However, in 1984 an Ethio-Lybian Mining Company was established to supervise the construction of an open-cast mine with an extraction capacity of about 1.5 million tons per annum as well as enrichment installations. The Ethiopian authorities planned to start extraction in 1990 and, to that end, signed contracts with the French chemical mining enterprise, FMF.

B. Prospects for the Potash Extracting Industry in the 1990s

35. The development of the Bolle and Denkel valley deposits will depend on supply and demand:

After three decades of rapid expansion, following the rise in agricultural production in Europe and North America, the world demand for potash stagnated between 1980 and 1987, bringing down the annual increase in potash consumption in the 1980s to 1.2 per cent, as against 4 per cent in the 1970s and 7 per cent in the 1960s. In 1987, however, the situation improved, resulting in a recovery in the demand for potash in 1988 which even brought about a rise in prices in 1989. However, it is not known whether this trend will continue in the 1990s. In fact, producers who had staked in an increase in potash consumption in the United States in 1988 and 1989, after the drought of 1987, became disappointed because the expected growth in America's demand did not occur. On the other hand, the closure of old mines in Western Europe and the United States, following exhaustion of potash reserves in Alsace, in France and two other reserves in New Mexico in the United States, by the end of the 1990s, may be of interest to African producers.

Political factors: In certain countries such as the United States, whenever the original inhabitants consider their interests threatened and therefore present their complaints, the government sets up a mechanism for

protecting the local industry concerned. And recently, Canadian producers have been affected by that policy, following protests by their colleagues in New Mexico. Another factor that affects conditions for fertilizer acquisition and which may constitute a handicap to the development of potash deposits in African countries is the aid provided by industrialized nations to African countries. In spite of the fact that their external debt situation has not improved, African countries will continue to ask for more aid whose further increase might dampen their motivation with regard to the execution of projects aimed at the development and use of potash.

Considerations with regard to environmental problems

36. These considerations generally concern fertilizer industries. In such industrialized countries as the United States and European countries, the use of complex fertilizers containing nitrogen disturbs the authorities, because of the possibility of nitrogen concentration in underground water. African producers of phosphates and potash should take account of this factor, both for the protection of their own environment and for access to European markets which would became increasingly difficult to please.

Conclusions and recommendations

37. The phosphate extraction industry in Africa is usually large-scale and the mining of this substance, except in Togo, is mainly integrated into that of other related substances; for instance, the production of crude phosphate is integrated into that of more sophisticated fertilizers. The crisis in the world market for crude phosphates between 1981 and 1988 seriously affected Africa's production of the substances, even though a slight improvement was recorded in 1988 as a result of a rise in prices.

One of the consequences of that crisis for African producers is an increase in the production for local industries. The results achieved in this respect by such countries as Morocco have been very encouraging and are a proof of the role of local consumption in the development of the mining sector.

A comparison of the evolution of phosphate production and that of fertilizer consumption shows that the rate of increase of the latter was higher during the period under consideration. This trend which will probably increase during the 1990s as a function of population increase, as earlier mentioned, would bring about an increase in phosphate production. However, owing to financing difficulties, only the intermediate deposits whose mining has been suspended will be encouraged through small-and medium-scale exploitation.

Statistics on production and consumption of fertilizers in the continent show that production has not followed the pace of consumption which has grown at a rate of 6 per cent per annum over the last few years. This difference between local production and consumption which should, in principle, widen during the 1990s as a function of population growth, may bring about the development (especially small- and medium-scale development) of the currently suspended phosphate mines in the continent. This will be in the regional and subregional context and may involve foreign participation.

Finally, the NPK compound fertilizers, whose manufacture and use pose environmental problems, are the most used in Africa.

III. CONSTRUCTION MATERIALS

A. Situation of the lime, burnt dolomite and cement industries in Africa

38. The term lime refers to all products obtained by roasting and/or calcination of calcareous materials. Such products are numerous (about 30) and they are used in a wide range of industries, particularly the three major sectors: chemical, construction and agriculture. The present study deals only with its use in construction.

Raw material resources

39. Like other industrial minerals, construction materials, in general and lime, burnt dolomite and cement, in particular, are considered to be of secondary importance in the principles of national development plans for mineral resources development. Hence information on them are rare and incomplete, and that is why lime/burnt dolomite raw material resources are very difficult to estimate. All that can be said is that they are very widespread and abundant in the continent. They are composed mainly of calcium carbonate (limestone) and magnesium carbonate (dolomite) usually found in sedimentary basins. Also in Africa are found calcareous sinter or travertines, along the volcanic systems and rifts, especially in East Africa which, together with

Southern Africa, have intrusive carbonatites. Finally, mention should also be made of corals and shells which abound along African coasts.

Production of lime and burnt dolomite

40. It is very difficult to give reliable statistics both on the production of lime-related raw materials in Africa and on lime itself. However, using the very little statistics available, it is possible to estimate Africa's annual production at 1 million tons.

Consumption

41. The annual consumption of lime/burnt dolomite is given in table 1. Here, North Africa dominates, with 15 times the consumption of Eastern and Southern Africa, 10 times that of West Africa and 20 times that of Central Africa. It should also be noted that construction accounts for only 4.53 per cent of the total amount of lime consumed by all the economic sectors using this substances put together (agriculture, steel and chemical industries, paper manufacturing, refineries and others).

Use in construction

42. Road construction is one of the sectors in which lime is used in developed countries. This is also a potential sector for the use of this substance in Africa in the future. In fact, the use of lime combined with such other materials as clay to stabilize soils is an old practice which dates back to more than 5,000 years ago. Unfortunately, this process is less practiced in the continent where bitumen is used, although the latter is affected by the alternance of seasons (dry and wet), resulting in contraction and swelling of road surface coatings. These effects can be minimized by

stabilizing the soil with lime which reduces their plasticity. In building, lime is used (a) in the making of bricks which are mainly composed of calcium silicate burnt in an autoclave and (b) in white-washing because of its absorption properties which reduce the effects of condensation, and its disinfectant properties which makes it useful especially in the rural areas where paints are not available.

Environmental considerations

43. The extraction of lime raw materials implies the removal of large volumes of landscape-modifying materials. Currently, African countries are not always concerned about rehabilitating mined sites. They should therefore give more attention to this aspect, henceforth.

On the other hand, lime has been long used for treating contaminated water. Over the last 20 years, air pollution by acidic gases from metallurgy, chemical and fuel plants has been a major concern of industrialized countries where the use of lime to desulphurize gas pipes contaminated with sulphur (SO_2) has become the order of the day. Africa should follow this example, not only to protect its environment, but also as an opening for the use of its lime resources.

Developments in the cement industry

44. Most cements belong to the "Portland" category produced by burning in a cementation furnace, often rotatory, a given quantity of the major raw material which is calcium mixed with silica, aluminum and iron oxide, contained in clay, schist and iron ore. Clinker, a compound composed of calcium and aluminate silicates is mixed with gypsum (4 or 5 per cent) and crushed into powder to form cement. The world consumption of cement has greatly increased over the last 20 years, reaching a rate of 210 per cent in 1985. Production has grown along with consumption, with an annual growth rate of 11 per cent between 1983 and 1987. The various trends experienced during this period of steady growth was due mainly to (a) demand following the internationalization of production (b) consolidation and restructuring of production units, (c) diversification and penetration of markets through excessively low prices, (d) aggressive export policy; (e) over production capacity well beyond demand and (f) liberalization of markets.

The European market which is very limited has, however, two great producers, Spain and Greece, the low prices of whose products are a threat to other European producers as well as Saudi Arabia. The three other large groups of intensive world cement producers are Holderbank, LAFARGE COPPEE and Blue Circle Industries PLC which control 10 per cent of the world market.

The Middle-East markets are currently suffering from an overproduction capacity resulting from a decline in the demand for this product in the region, following the completion in the 1970s and 1980s of the large construction projects initiated at the beginning of the 1970s. This situation has led Japan and Spain, the traditional suppliers of cement to the Middle - East, to look for alternative markets.

In Africa, some measures have been taken by governments to reduce dependence of their countries on imported construction materials, in general and cement, in particular. These measures are aimed, inter alia, at reducing import of such binding materials as cement.

45. The continent accounts for only 3 per cent of world cement production, trailing far behind after the Soviet Union (15 per cent), Japan (10 per cent) the United States (9 per cent) the 19 European countries (32 per cent), Asia (12 per cent) and the other American countries (8 per cent). The production of Nigeria one of Africa's largest producers increased considerably between 1978 and 1986. During that period, Nigeria's cement import fell to 4 per cent from 8 per cent due to increased local production and reduced import.

B. Prospects for the Construction Material Industry (lime, burnt dolomite and cement) in the 1990s

The market

46. The 1980s were characterised by a decline in world demand for lime/burnt dolomite in the various sectors using these substances, including construction. The future of the lime and burnt dolomite industries depends on new markets which will emerge to meet such environmental requirements as desulphurization, soil stabilization, asphalt reinforcement and other construction uses.

After a rise in its demand at the beginning of the 1980s, the cement industry was confronted at the end of that decade by an overproduction capacity in relation to demand. Thus, producers have adopted a number of strategies such as drastically reducing prices in order to conserve their markets.

In the African continent, it is thought that demand for essential construction materials will strictly follow the rate of construction which, currently very little developed, especially in sub-Saharan countries, constitutes a potential local market which, at the moment is being satisfied by imported cement. Several African countries are currently conducting researches to identify less expensive materials which will contain little amounts of such imported inputs as cement. These policies are aimed at reducing the dependence of these countries on imported construction materials, which will in the long term promote local development of such substances.

Constraints to the development of the construction material industry in Africa

The lack of information on the availability of raw material resources

47. Studies on deposits of such major construction raw materials as lime, dolomite and clay are very few, indeed rare. Where they exist, they are very old, with little information, especially on the chemical, physical and mechanical characteristics which are fundamental factors for taking decisions relating to the mining of construction material resources and the establishment of relevant manufacturing industries.

Political constraints

48. Despite certain researches conducted on construction materials in such countries as Ethiopia, Burkina Faso, Côte d'Ivoire and Mali, the policies of most African governments, till date, favour importation of construction materials. Hence, the construction material industry is relegated to the second place in terms of priority sectors in national economic and social development plans. This is reflected in the lack of plans to set up

production companies, factories and units which would contribute to the development of this industry that is indispensable for housing promotion.

Economic and financial constraints

49. The current and future situation of the world market for construction materials does not encourage foreign investment in the continent. African countries should therefore resort to their own financial resources. Nevertheless, African State resources are very limited and their use in a sector considered as secondary is very difficult, particularly, given the countries' debt problems and the economic recovery measures being implemented by their governments.

The non-existence of specialized institutions for the financing of small- and large-scale enterprises or even small handicrafts production units further compounds the problem.

Socio-cultural constraints

50. These generally affect all locally manufactured products. The reluctance of people to purchase and use products often considered to be of poor quality and non-lasting, because they are manufactured locally, is also a handicap to the development of the construction material industry.

Conclusions and recommendations

51. The construction material industry in the continent is little developed. The current policies of most States which favour imports and trade liberalization is a handicap to the success of this industry. Nevertheless, the industry may benefit from a local market that is bound to grow, considering the underdeveloped state of road, airport and building construction which are marked out for development. Import substitution by local products is very crucial for the economic recovery of African countries. It can be achieved if there is the political will, which should imply such measures as:

(1) Giving a greater importance to the construction material industry in national development plans and strategies;

(2) Gaining a greater knowledge about the sources of construction raw materials by:

- Conducting intensive research to identify new deposits;
- Deepening knowledge of already identified deposits through the evaluation of reserves and determination of their physico-chemical characteristics;
- Updating information and statistics on the reserves;
- Providing the interested public and potential investors with the relevant information and data.

(3) Encouraging the establishment of production units by:

- Facilitating the access of local private investors to raw material deposits without paying royalties;
- Providing tax-free bank loans for financing investments;
- Complete removal of import duty on materials and equipment necessary for the execution of investments which will benefit from concessional fiscal conditions;
- Establishment of advisory bodies on exploitation, processing and management.

(4) Setting up of a structure to be responsible for product quality standards and control in order to stimulate public confidence in and consumption of locally manufactured products.

Estimated burnt
main consumer a

Area	North Africa	Eastern so Southern A
1. Steel making	357,975	83,775
2. Sugar refining	174,250	1,009
3. Mineral processing		
a) flotation	30,256	129,359
b) lime cyanidation	2,635	20,995
c) alumina	nil	nil
d) iron ore pelletiz-ation	nil	nil
4. Paper and pulp	6,860	360
5. Water treatment		
a) urban population	98,750	40,462
b) rural population		
6. Building/Construction	(40,000)	(4,000)
7. Agriculture	nil	nil
8. Other minor users	(40,000)	(4,000)
	558,726	284,760

( ) estimate

olomite and lime consumption in Table No. 1
eas in 1985 (tonnes)

Subregion West Africa	Central Africa	Total	%
rica			
24,680	880	267,310	24.21
609	73	176,741	16.01
13,390	60,618	241,823	21.90
1,736	11,250	36,616	3.32
57,100	nil	57,100	5.17
nil	nil	nil	nil
360	360	7,340	0.72
52,600	24,727	216,539	19.61
nil	nil	nil	
(4,000)	(2,000)	(50,000)	4.53
nil	nil	nil	nil
(4,000)	(2,000)	50,000	4.53
158,475	102,108	1,104,069	100.00

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